

C. SOLID WASTE DISPOSAL

C.1. Capacity Analysis

The current capacities and recent utilization of commercial waste and recycling facilities are presented in Appendix table C-1. The capacities listed were drawn from current permits/approvals, district plan amendments or submitted application documents. The capacities listed for landfills are the total remaining volumes as of the most recent topographic surveys. The capacities listed for transfer stations and Class B recycling centers are provided as tons per day, while the capacities listed for resource recovery facilities are provided as tons per year. The capacities listed for Class C recycling centers are provided as cubic yards per year; where they were reported in tons, a conversion of 5 cubic yards per ton was used. The utilization shown was drawn from the monthly tonnage reports submitted by transfer stations and resource recovery facilities, the annual topographic surveys submitted by landfills and the annual reports submitted by recycling centers. The percent utilization values listed for transfer stations and Class B recycling centers were derived by dividing the calendar year 2001 utilization of each facility by an annualized capacity for the facility computed on the basis of 300 days of operation. The percent utilization values listed for resource recovery facilities were derived by dividing the calendar year 2001 utilization of each facility by the facility's annual capacity. The percent utilization values listed for Class C recycling centers were derived by dividing the calendar year 2001 utilization of each facility by the onsite capacity of the facility. The percent utilization values listed for landfills were derived by dividing the calendar year 2001 utilization by the average utilization of the landfill for the previous four years.

The analysis shows that the utilization of the five resource recovery facilities ranged from 89% to 97%, indicating marginal additional capacity available, while the utilization of the thirteen landfills ranged from 39% to 156%, with a typical value of approximately 120%, indicating little additional capacity available. Because a landfill has a fixed total capacity, an increase in capacity utilization corresponds to a decrease in the lifespan of the landfill, and will result in an earlier closure. The analysis also shows that the utilization of transfer stations ranged from 35% to over 100%, with a typical value of approximately 70%, indicating a significant additional capacity available. The analysis further shows that the utilization of Class B recycling centers ranged from 1% to over 100%, with a typical value of approximately 30%, indicating a substantial additional capacity available. Lastly, the analysis shows that the utilization of Class C recycling centers ranged from 5% to well over 100%, with a typical value of approximately 100%, with over 40% of the facilities exceeding their authorized capacities. This indicates that many of the Class C recycling centers are undersized.

The following abbreviations are used in the table:

Solid Wastes:

10 = Municipal (household, commercial, institutional) waste

13 = Bulky waste

13C = Construction and Demolition waste
23 = Vegetative waste
25 = Animal and Food Processing waste
27 = Dry Industrial waste
27A = Asbestos, or Asbestos-Containing, waste
27I = Incinerator Ash or Ash-Containing waste

Class B and Class C Recyclable Materials:

A = Asphalt
ABRM = Asphalt-Based Roofing Material
B = Brush
B&B = Brick and Block
C = Concrete
CWA = Commingled Wood and Aggregate
G = Grass
L = Leaves
PCS = Petroleum-Contaminated Soil
SS = Street Sweepings
SSSW = Source Separated Supermarket Waste
T = Tires
TP = Tree Parts
TRS = Trees
TS = Tree Stumps
W = Wood (unpainted, not chemically-treated)
WC = Wood Chips

Capacities:

cy = cubic yards
cy/yr = cubic yards/year
tpd = tons per day
tpy = tons per year

C.2. Sustainable Landfills

The siting and construction of any new regional landfill would be an expensive proposition, and most likely become a lengthy process and raise significant public

opposition. Such opposition would not only include the expected objections from those persons near the proposed landfill site and those along the primary access routes, but would also include objections from local taxpayers opposed to the incurrence of bonded debt necessary to finance the project, should the proposed facility be publicly financed. Indeed, in certain areas of the State there may be no suitable site to locate a new regional landfill. The existing regional landfills in New Jersey have limited area for lateral expansions through the addition of new cells, and limited onsite supplies of cover soils to support facility expansions.

Consequently, the employment of innovative technologies to extend the useful life of the existing regional landfills is a growing trend. This concept has become known as the "sustainable landfill". Several such innovative technologies have been proposed, and a number are already being tested at regional landfills around the State. These innovative technologies include:

Leachate Recirculation

Also referred to as a "bioreactor" landfill, this technology entails the recirculation of leachate through the waste of a filled landfill cell. Such recirculation accelerates the rate of decomposition of the waste by engendering decomposition deeper into the landfill. There are two types of bioreactors: aerobic and anaerobic systems. Aerobic bioreactors involve both leachate recirculation and air injection, which occur simultaneously. Anaerobic bioreactors involve only leachate recirculation. The aerobic decomposition occurs much more rapidly than the typical anaerobic decomposition that would otherwise prevail, due to an increase in microbial digestion rates, and leads to a more rapid settlement of the waste in the cell. Anaerobic bioreactors result in an increase in methane gas generation, which may be suitable for energy recovery such that capital costs are subsidized by the increase in gas generation rates. Due to enhanced degradation and stabilization rates, both aerobic and anaerobic bioreactors result in "reclaimed" capacity for future additional landfilling.

Use of Temporary Caps

The placement of a synthetic membrane over top of a filled landfill cell, as a temporary cap, rather than the placement of the normal final cover layer, which would entail substantial quantities of soils, avoids the consumption of space that the soils would otherwise occupy. The membrane of the temporary cap can be weighed down with removable items, such as old tires, without the use of soils. When used in conjunction with leachate recirculation or active gas extraction, the temporary cap is readily removable, and consumes no capacity, when the cell is reopened for future landfilling.

Use of Tarps as Daily Cover Material

The use of retractable tarps to replace the use of daily cover soil is being tested by some landfills. The avoidance of the use of daily cover soils can substantially increase the landfill space available for the waste. Use of sprayed foam material as an alternative to

daily cover soil has also been suggested, although it is not currently used or proposed for any landfill in New Jersey.

Use of Alternative Daily and Intermediate Cover Materials

The use of soil-like waste materials, rather than actual soils, as daily and/or intermediate cover materials, also can substantially increase the landfill space available for the waste. Similarly, such wastes have also been used as select fill on the base of new landfill cells, to protect the bottom liners from risk of puncture.

Use of Geosynthetic Clay Liners in Place of Compacted Clay Liners

Several landfills have opted to replace the originally-planned compacted clay bottom liners with Geosynthetic Clay Liners (GCLs) that have equivalent performance standards. Since the compacted clay liners would have been several feet thick and GCLs liners are less than one inch thick, this substitution substantially increases the landfill space available for the waste.

Landfill Mining

The concept of excavating old landfilled areas to recover recyclable items, cover soils or the landfill capacity itself, has been around for several years. Although the department has not found the recovery of recyclable items from old landfills to be viable, due to the poor quality and contamination of the separated materials, there may be instances where cover soils, and the landfill space, may be recoverable items. Landfill mining, however, may be conducive following the aerobic or anaerobic bioreactor decomposition process since the waste has been fully decomposed and stabilized.

Deterrence of Bulky Wastes

Several landfills have developed strategies to deter bulky wastes, including construction and demolition wastes, tires, carpets, tree parts etc. Many bulky wastes are inert, and will not decompose in a landfill, and may cause sizeable void spaces around them when they are buried in a landfill. Consequently, they can represent an inefficient use of landfill space. Additionally, recycling opportunities often exist for many of the bulky wastes, and others are under development. One deterrence strategy employed to date is higher tipping fees for bulky wastes. Another is the construction of recycling and/or materials recovery facilities at the landfills, to remove the bulky wastes from the incoming shipments. One facility segregates tires, and shreds them for use as an alternative to crushed stone in landfill construction. Another proposes to crush construction and demolition wastes to create alternative cover material. Several regional landfills have associated regional Class B and Class C recycling centers that can handle the deterred bulky wastes, if properly segregated at the source.

Landfill Surcharging:

The practice of surcharging a landfill when it nears final elevations has also been suggested. A substantial weight of surcharge materials would be placed on top of the landfill and left there for a period of 6 to 12 months. This added weight could significantly increase the settlement of the landfill, thereby creating additional capacity that would be realized after the surcharge materials were removed. Typically, clean soils would be used as the surcharge materials, as they could be used elsewhere at the landfill after the surcharging was completed.

The department supports these initiatives to maximize and extend the useful life of existing landfills. The department has allowed innovative technologies to be developed and tested under Research, Development and Demonstration (RD&D) permits, and will continue to support the development of new technologies through this means.

C.3. Landfill Closure Planning

Objectives and Criteria: New Jersey residents and businesses generated over 10 million tons of solid waste each year over the past decade. Historically, this material was disposed of in landfills. Prior to the late 1970s, there were no detailed statewide regulatory requirements governing the manner in which solid waste was landfilled. Material also came into New Jersey from neighboring states in an uncontrolled manner. The material generally was dumped with little or no provision for cover to prevent odor, to control birds, insects and rodents or to minimize long-term environmental impact. Beginning in the 1970s, the state began to register landfills and regulate their operation, imposing increasingly stringent environmental controls. Currently, New Jersey has among the most stringent design and environmental performance requirements for new landfills in the nation. Nevertheless, the legacy of past landfills that were not designed with stringent controls for protection of the environment and which were, for the most part, not properly closed, remains a significant challenge facing the state. Improperly closed landfills present a series of potential problems:

- Natural precipitation percolating through landfills produces leachate, which can have a higher concentration of pollutants than untreated domestic sewage. If this material, in the absence of suitable final cover and/or drainage controls, is allowed to discharge to streams or to groundwater, it can produce serious water resource impairment. Most landfills established prior to the mid-1970s lacked any leachate collection or control systems. These landfills discharge leachate to surface waters and groundwaters;
- Closed landfills that do not have leachate collection/control systems may require costly retrofitting of such systems to control discharges to surface water and/or groundwater;
- Many landfills in operation prior to the State environmental laws accepted all types of waste, including industrial and chemical waste. Even after more stringent state regulation of landfills began, industrial and chemical waste continued, in some cases, to be illegally disposed of in landfills permitted for municipal waste. Therefore, many closed landfills

may contain varying amounts of hazardous materials. Although many of these landfills containing significant concentrations of hazardous wastes have been "discovered" and are designated within state programs for hazardous site cleanup, new cases of closed landfills containing hazardous materials are still being discovered;

- Municipal solid waste contains small amounts of many household hazardous materials. This is true because even the average homeowner uses and disposes of paints, cleaning agents, solvents and pesticides/herbicides that contain hazardous materials. When the small amounts are aggregated at a disposal site, a significant level of hazardous materials may result.

In light of the above, the landfill closure objectives of the Department are:

Identify those landfills which have terminated operations, but have not been properly closed consistent with DEP closure requirements;

Identify the closure requirements needed by each of these landfills;

Rank these landfills according to the severity and significance of the environmental risks they pose;

Identify responsible party or alternative funding sources to pay for proper closure of these landfills; and,

Where necessary, to remediate those landfill sites that are polluting the ground and surface waters of the state.

Universe of Concern: There are over 600 known or suspected landfills in New Jersey. There have been approximately 400 landfills that registered with DEP and are known to have accepted solid waste, and DEP has fairly detailed records on these facilities. There are approximately 200 additional sites that are known or suspected to contain buried solid waste, but never registered with the DEP. The DEP has very limited records on these unregistered facilities. These numbers are stated as approximations because there have been different representations of the numbers in the past, and the numbers themselves are subject to change. There have been new registration numbers issued to existing landfills in the past, particularly when the landfills have changed ownership, expanded in capacity, or added new lots or blocks, and consequently some previously reported numbers of registered landfills have included certain redundancies. Additionally, the numbers of unregistered landfills, as well as suspected landfills, change frequently as new discoveries of previously unidentified waste burial locations are uncovered by environmental site assessments and redevelopment activities.

Of the approximately 400 registered landfills, more than half ceased operations prior to January 1, 1982, and were not required to submit detailed closure and post closure care plans, although they were required to install and maintain a two foot soil final cover. The DEP commonly refers to these landfills as the "pre-1982" facilities. Detailed plans are required of the 163 landfills which operated beyond January 1, 1982, as they are subject to the "Sanitary Landfill Facility Closure and Contingency Fund Act" (Closure Act), N.J.S.A. 13:1E-100, which makes those landfills subject to comprehensive regulatory controls upon closure. The Closure Act also imposed a tax on those landfills that operated

beyond January 1, 1982, with the proceeds accruing in escrow accounts specifically dedicated to landfill closure. The DEP commonly refers to these landfills as the "post-1982" facilities. Presently, 141 of the 163 post-1982 landfills have closed, while 22 continue to operate.

The DEP divides the universe of landfills into three broad categories:

Regional commercial (R): larger landfills which accepted solid waste from multiple municipalities and which, in most cases, charged a BPU approved tariff rate or tipping fee;

Municipal (M): landfills which almost exclusively accepted municipal solid waste only from the community within which it was located; and

Sole source (SS): generally smaller landfills which accepted solid waste only from a single source, such as an industrial landfill for plant-generated waste, or a business landfill, such as that used for a contractor's disposal of construction and demolition debris or tree stumps.

The regional commercial landfills comprise 13 of the 22 active post-1982 landfills and 22 of the 141 closed post-1982 landfills. The latter number includes 10 that have completed approved closure plans and are now under post-closure care, 1 that has not yet completed an approved closure plan, 4 with closure plans under review, 1 with a closure plan found deficient and 6 with no closure plans. The municipal landfills comprise 1 of the 22 active post-1982 landfills and 78 of the 141 closed post-1982 landfills. The latter number includes 20 that have completed approved closure plans and are now under post-closure care, 10 that have not yet completed an approved closure plan, 13 with closure plans under review, 22 with closure plans found deficient and 13 with no closure plans. The sole source landfills comprise 8 of the 22 active post-1982 landfills and 41 of the 141 closed post-1982 landfills. The latter number includes 9 that have completed approved closure plans and are now under post-closure care, 7 that have not yet completed an approved closure plan, 6 with closure plans under review, 9 with closure plans found deficient and 10 with no closure plans. In total, 39 of the 141 closed post-1982 landfills have completed approved closure plans and are now under post-closure care, 18 have not yet completed approved closure plans, 23 have closure plans under review, 32 have closure plans found deficient and 29 have no closure plans. Appendix table C-2 identifies the 22 active post-1982 landfills, while Appendix table C-3 identifies the 141 closed post-1982 landfills, listed by closure plan status.

Financing Landfill Closure: The availability of funding to pay for proper closure of a landfill is the critical factor in achieving the closure. The unregistered universe is primarily comprised of landfills that closed prior to the January 1, 1982 effective date of the Closure Act and therefore, it is reasonable to assume that no dedicated funds exist for closure. Similarly, the registered landfills that closed prior to January 1, 1982 are unlikely to have any dedicated funding source to address closure. Essentially, only the 163 facilities that remained in operation beyond the January 1, 1982 effective date of the

Landfill Closure Act have any accrued funds to pay for closure and post-closure care costs.

Generally, the 35 regional commercial landfills have significant funds placed within DEP established and monitored escrow accounts (although a few have insufficient funds). Most of the 79 municipal landfills have negligible escrow resources, while most of the 49 sole source facilities are without any dedicated closure accounts. This has partially resulted from the design of the Landfill Closure Act tax program where monies were collected on the basis of cubic yards of solid waste received. Municipal and sole source landfills which closed shortly after January 1982, or which remained open and took very small amounts of waste, have extremely limited escrow reserves.

From the above, it is clear that available financial resources are extremely limited given the scope of even the registered landfills which have not undergone any DEP-guided closure procedure. In this regard, it is important to address what proper closure is and what it may cost. The scope of closure at any particular site is a function of the amount and types of materials known to have been deposited and the results of groundwater, surface water and gas monitoring as an indicator of what is being discharged from the facility. Size of the facility, location, length of operation and other variables also interplay in determining needed closure measures.

For presentation purposes, it is possible to estimate closure costs on a per acre basis. Based upon existing DEP regulations found at N.J.A.C. 7:26-2A.9, all closure activities involve some degree of grading, landscaping, revegetation, site securing, drainage control, capping and groundwater monitoring. Based upon historical experience in the DEP's solid and hazardous waste management programs, the following broad cost estimates can be made. For a facility that requires the most limited level of closure, involving a soil cap, revegetation, security, drainage control and groundwater monitoring, a cost of up to \$180,000 per acre can be estimated. A more detailed closure involving an impermeable cap with a single synthetic geomembrane could cost up to \$225,000 per acre. Finally, a full capping scenario involved in a remediation case where substantial contamination has been identified and where a 24-inch clay cap and synthetic membrane was used, could cost up to \$700,000 per acre. Given these rough estimates and assuming a municipal landfill size of 20 acres, the capital cost of closure could range from \$3.6 million to \$14 million for a single site.

Strategies Implemented To Date:

The department has implemented the following actions to address landfill closure over the past several years:

Addition of Pre-1982 registered facilities to the Comprehensive Site List

Since pre-1982 registered landfills are usually not required to submit closure plans, an initial strategy was to add these facilities to the Comprehensive Site List (CSL) maintained by the DEP's Site Remediation Program (SRP). This action was completed in the mid-1990s, with the intent that site assessments would be performed, and the

information gathered would provide the basis for ranking the sites on potential human health and environmental risk to enable the worst sites to be identified and remediated first. However, due to the very large number of sites on the CSL, few assessments had been completed through the year 2000. In 2001, these sites were included in the site evaluation and scoring developed and conducted in response to the impending expiration of authority to press claims under the Statute of Limitation (SOL) legislation. The sites scored relatively low, but this may have been largely from the lack of real data about the environmental conditions at the sites and biases within the scoring towards sites of known chemical contamination.

Use of Public Funds

Two years ago the DEP assessed the universe of closed landfills to identify those that were potentially significant contributors of greenhouse gas emissions and that posed significant threat of leachate impacts to ground and surface waters. Those landfills (both pre- and post-1982) having the greatest volume of municipal solid waste were identified, and then screened on the basis of watershed priorities, availability of a responsible party with funding, and the degree to which environmental controls have been accomplished to date. Approximately 100 candidate landfills were reviewed and the focus was narrowed to 16 facilities located within the Hackensack Meadowlands area, the Barnegat Bay watershed area, the Delaware River drainage area and the Pinelands. Appendix table C-4 identifies these 16 landfills. The DEP anticipated using excess Corporate Business Tax (CBT) funds and other public money sources (such as federal greenhouse gas grant funds and Maritime Resources dredging funds), in conjunction with available escrow funds and third party initiatives (such as New Jersey Meadowlands Commission (NJMC) and private developers) to seek proper closure of these 16 sites on a priority basis. The DEP is taking the lead on closing the largest site with CBT funds, and the NJMC plans to close two of the sites through limited additional landfilling of select waste. Private developers are pursuing closure/redevelopment of two of the sites (plus two additional smaller adjacent sites), and the landfill owners are to close two of the sites. The remaining nine have been transferred to the SRP for publicly funded closure and cost recovery actions. These actions are ongoing.

Brownfields Redevelopment

In addition to the private developer landfill closures noted above, the DEP has also supported several other third party landfill closure projects. Some of these have included traditional closures using purchased capping materials and clean fill soils, spurred by the potential recovery of expenditures from future tax collections on new businesses operating on the closed site, under the provisions of the Municipal Landfill Site Closure, Remediation and Redevelopment Act and the Brownfields Redevelopment Act. Others have been self-funding closures financed by the acceptance of revenue-producing residual materials beneficially used in landfill drainage, venting, capping and cover systems.

Joint Enforcement and Permit Strategy

The universe of post-1982 closed landfills was evaluated to identify:

- 1) Those landfills that had completed approved closure plans and were under post-closure care;
- 2) Those that had received approval of closure plans but had not yet completed the closure work;
- 3) Those that had submitted closure plans that the DEP had found deficient; and,
- 4) Those that had never submitted closure plans.

The evaluation revealed 38 landfills that had completed approved closure plans and were under post closure care (10 regional, 19 municipal and 9 sole source), 15 landfills that had received approval of closure plans but had not completed the closure work (1 regional, 7 municipal and 7 sole source), 53 landfills that had submitted closure plans that had been found deficient (30 municipal and 22 sole source), and 35 landfills for which closure plans had never been submitted (10 regional, 22 municipal and 3 sole source).

The DEP enforcement program issued notices of violation to the owners of the 35 landfills for which closure plans had never been submitted and the landfill permit program then sent follow-up letters to the owners, advising that the department was willing to meet to discuss the closure requirements. To date, closure plans have been submitted for 11 of the landfills (all municipal), and the department has approved 4 of the closure plans.

Simplify Financial Assurance Requirements for Municipal Landfills

Many of the inactive post-1982 landfills that have not yet received approval of closure plans are municipal landfills (48 out of 83), and a significant fraction of these closed shortly after the January 1, 1982 effective date of the Closure Act. Consequently, in many instances these municipal landfills have only modest sums in their escrow accounts, and this lack of dedicated funds to pay for closure and post-closure care activities has often been the major deficiency preventing the department from issuing a closure plan approval. Additionally, maintaining oversight of these modest sum escrow accounts has proven to be a costly burden on the department, the municipalities and the financial institutions involved. The department had previously required municipalities to incur bonded debt or to enter Administrative Consent Orders (ACOs), with stipulated penalties, to compel the municipalities to include landfill closure and post-closure care costs in their municipal budgets each year as an alternative to fully-funded escrow accounts. Several municipalities had balked at the harshness of these requirements. The department has recently explored allowing municipalities the freedom to use the modest sums in the escrow accounts to pay for closure plan development and implementation, and not require that the escrow accounts be maintained as the last resort. The department has also explored relying on the good faith commitment of the municipalities to annually budget the necessary closure and post-closure care costs, without the requirement of the onerous bonded debt or ACOs.

Strategies for the Future:

Completely Identify the Universe and Status of each Landfill

The department should develop and maintain clear and updated records of the complete known and suspected landfill universe. These records should include detailed information about the location, type, size and age of each landfill, as well as the closure requirements applicable to each landfill and the current closure compliance status of each landfill. This information should be posted on the internet for ready access by the general public. The department will strive to complete this data development and posting by the end of calendar year 2003.

Continue current strategies

The department should continue the strategies implemented to date, as each offers the potential to advance an incremental portion of the closed landfill universe towards completion of proper closure. Specifically, the department will target the following:

Comprehensive Site List (CSI) - Although the CSL itself may be replaced by an alternative records database, the Department will develop a list all of the known landfills, including unregistered facilities. The department will include all solid waste disposal sites known to the SRP in the Division of Solid and Hazardous Waste records, to ensure that the list include all known landfills. The department will strive to complete this by the end of calendar year 2003.

Use of Public Funds - The department is in the process of re-evaluating landfills as part of a larger strategy on determining how best to prmitize the use of public funds.

Brownfields Redevelopment - The department will aggressively promote the private developer and self-funding landfill projects, to maximize the accomplishment of desired landfill closures that can be achieved without use of public funds.

Joint Enforcement and Permit Strategy - The department will continue the strategy and expand it to target inspection and evaluation of closure status at landfills for which approval of closure plans had been issued, but closure completion had not been certified, as well as to pursue the submittal of acceptable closure plans for those landfills for which previous closure plan submittals had been found deficient. The department will strive to follow up on all of the landfills in these categories by the end of calendar year 2003. Additionally, the department will expand the strategy thereafter to include the field assessment of proper closure conditions at pre-1982 closed landfills. The department will strive to complete these assessments, and to initiate such directives for improvement as may be warranted based on these assessments, by the end of calendar year 2006.

Simplify financial assurance requirements for municipal landfills - The department will pursue the phase out of the modest-sum escrow accounts for municipal landfills and to eliminate the requirements for bonding future closure and post-closure care costs and the use of ACOs. The department will instead rely on the good faith commitment of municipalities to annually budget the necessary closure and post-closure care costs.

Pursue alternatives to impervious caps on the smaller landfills in the Pinelands

A sizeable fraction of the post-1982 landfills that have not yet been properly closed are situated in the Pinelands, where there is a requirement for an impervious cap for such proper closure. Many of these were relatively small municipal landfills where solid wastes were deposited in shallow trenches or area fills in sandy soils, and which ceased operating shortly after 1982. The department believes that for some of these landfills an impervious cap may be an unwarranted and excessively expensive requirement at this point in time, due to the decomposition of the wastes that may have occurred since the landfills stopped operating, the porous nature of the local soils and the shallow depths of the deposited wastes. The department proposes to explore for possibilities to reduce the impervious cap requirement for some of these landfills, to hopefully enable an acceptable alternative closure plan to be implemented, and to finally achieve an acceptable closure of such landfills.